Control of Paddy Borer *Schoenobius incertulas* Walker on the Second Rice Crop in Taiwan from 1958—1961

By

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INTRODUCTION

Although the paddy borer *S. incertulas* is most persistent and is found anywhere throughout Taiwan, it causes the damage to rice and varies from year to year in order to attribute many factors such as local climate, different environmental conditions and agricultural practices. The damage to the first rice crop is more injurious than to the second rice crop with abnormal outbreak in certain years. However, paddy borer infestation on the second rice crop is usually more prevalent in Chia-nan districts than any rice area on the island, because of the cultivating rice depending on rainfall and the irrigation facilities is mostly complicated by dividing into the first, intermediate, second crop or delayed second crop after jute crop harvest annually. Obvisously each generation of this pest emerged has the continued presence of the host plants for their multiplications throughout the year, so that their populations have steadily increased from generation to generation and cause large damage to rice. Especially they attack the intermediate and second rice crop or delayed second crop, resulting in a loss of 25% to 50% at harvest under prevailing climatic conditions. Within the last ten years, parathion and endrin have been extensively used for controlling the borer on the island. Since these dosages had been proven to give an excellent control of this pest by us from 1953—57. The use of certain new insecticides in the fields were tested as compared with parathion (folidol or ekatox) and endrin from 1958—'61. The results of these experiments are presented in this paper.

1958-1959 Experiments. - Methods and Materials. The field trials were carried out at Shang-tzu-ting, Chia-yi Agricultural Experiment Station. It was divided into four blocks of 12 plots each. Plots were 25 sq. m. in 1958 and were 27.5 sq. m. in 1959. plot had 500 hills in each of the experiments. The plants were spaced 25 cm by 20 cm apart in 1958 and spaced 25 cm by 25 cm apart in 1959. The variety of rice used was all Chia-nung No. 242, which was transplanted on July 28 in 1958 and transplanted on July 24 in 1959. The plots were arranged in randomized blocks with four replications of each treatment in the experiments. The treatments consisted of emulsifiable concentrates of 19.5% endrin, 20% gusathion, 46.6% folidol, and 20% ekatox with the exception

of 50% ekatox in 1959. The concentrates of each insecticide were based on spraying the active ingredient at 0.48 to 0.96 kg per hectare. Two applications were made with a small type of automatic sprayer on Sept. 20 and 29 in 1958 and sprayed on Sept. 9 and 19 in 1959. It repeated at 9 to 19 days of intervals, depending upon the degree of infestation in the fields. Since the fifth generation of this pest started to attack the boot stage or negligible tillering stage. The rate of application was at 1,200 liters of dilution per hectare each of the experiments. The percentage of empty panicles or white heads was determined by examining 300 hills at random in each plot 2 weeks before harvest. The percentage of empty panicles was then transformed to angles for analysis of variance.

Results

The percentage of empty panicles except ekatox, folidol and endrin sprays was not significantly different between the different insecticides and various concentrations and gave significantly different lower than the control in the experiments. All treatments excepting various folidol sprays and other low treatments showed signficant differences in yield of rice over the contról, but high dosage of treatments gave better than low ones. All treated plots except low dosage both of folidol and gusathion sprays in 1959 experiments gave significantly higher yields than in the untreated plot. There were no significant differences among the insecticides and were only significantly different among the concentrations used. All plots receiving from higher concentration of various insecticides were nearly equal in effectiveness against this borer, but folidol was not so effect as the other treatments in 1958 experiments, as shown in table 1.

1960 Experjment. - Methos and Materials. The field trial was also carried out at Shang - tzu - ting. The experiments divided were as described above. Each plot was 25 sq. m. including 400 hills in which there were 20 rows having 20 hills per row. The plants were distant as described above. The variety of rice was similar to that in the previous tests. It was transplanted on July 26. Eight different treatments and four untreated plots were assigned at random in each of block. The treatmenis consisted of 19.5% endrin, 46.6% folidol, 20% ekatox and 50% sevin wettable powder, to determine the effectiveness of several insecticides and of concentrations used against this pest. The treatments beside the 2.4 to 4.8 kg of active materials of sevin were based on spraying the 0.48 to 0.96 kg of active materials per hectare. Two applications were made with same equipment on Aug. 26 and Sept. 20 for control of the borer and brown plant hopper when they were begining to attack the crop from tillering stage to boot stage. But the populations of the borer were not so abundant as the brown plant hopper throughout the whole season. The rate of application was similar to that used in the former process. The percentage of empty panicles was determined by examining 200 hills randomly selected in

each plot 4 weeks before harvest.

Results.

According to the percentage of empty panicles, each treatment reduced the paddy borer infestation below that of the check. There was no significant differences between the insecticides and the concentrations used.

The yield of rice from the treatments gave sigificantly higher than from the untreated plot. There were also significant differences among the concentrations. Good control of this pest was obtained with higher concentration in each treatment, higher concentrations of endrin sprays gave highest yields in the experiments, and thus those dosages were nearly equal in effectivenss against these pests, as shown in table 1:

1961 **Experiment. - Methods and Materials.** The field trials were laid out at Tai-tou-keng in the suburb of Chia-yi. The size of plot and distance of plants were as described above. Eight differences of treatments assigned were similar to that used in the previous process. In controlling this borer, 40% M-folidol, 50% sumithion, 46% EPN and 50% sevin wettable powder were used. The treatments consisted of two concentrations at 0.72 t0 1.44 kg of active materials in each per hectare. The variety of rice was as mentioned above. It was transplanted on Aug. 5. Sprays were made from emulsilfiable concentrates and applied with same equipment on Sept. 21, Oct. 2 and 12 when the fifth generation of the borer started to attack the crop from boot stage to panicle stage during which it caused to become the empty panicles, resulting in the losses of rice production. The rate of application was similar to that used in the former process. The percentage of empty panicles determined was as mentioned above

Results.

The percentage of empty panicles with the exception of low sevin spray was significantly lower than in the untreated plot. The yield of rice

Table 1.- Control of paddy borer on the second ricd crop with certain insecticides in 1958-'61

Emulsion and wettable powder used	Empty panicle Per cent	Empty panicle Angle	Yield of rice kg/ha.	Index
Experiment in 1958 (Applications on Sept. 20 and 29)				
Folidol 0.02%	0·8	5.6	4,700.0	106.0
Folidol 0.04%	0.4	3.4	4,844.0	109.0
Gusathion 0.02%	1.0	5.2	4.684.0	105.7
Gusathion 0.04%	0.5	3.9	4,992.0	112.6
Endrin 0.02%	0.9	5.2	4,700.0	106.0
Endrin 0.04%	0.5	3.9	4,964.0	112.0

Ekatox 0.02%	0.9	5.4	4,648.0	104.0
Ekatox o.04%	0.2	2.5	4,944.0	111.5
Check (untreated)	2.7	9.0	4,433.0	100.0
L. S. D. at 5% level		2.6	448.0	
1% level		3.5	603.3	
Experiment in 1959 (Applications on Sept. 9 and 19)				
Folidol 0.02%	3.5	10.7	4,128.0	111.9
Folidol 0.04%	2.6	8.8	4,544.0	123.3
Gusathion 0.02%	6.0	14.0	4,128.0	111.9
Gusathion 0.04%	4.0	11.0	4.416.0	120.9
Ekatox 0.02%	4.0	11.5	4,512.0	122.4
Ekatox 0.04%	2.2	8.3	4.627.0	124.8
Endrin 0.02%	4.0	11.3	4,192.0	113.6
Endrin 0.04%	2.4	9.0	4,640.0	125.8
Check (untreated)	9.6	18.0	3,688.0	100.0
L. S. D. at 5% level		2.8	441.2	
1% level		3.2	592.0	
Experiment in 1960 (Applications on Aug. 26 & Sept. 20)				
Folidol 0.02%	1.7	6.5	4,464.0	122.1
Folidol 0.04%	1.0	5.5	4,612,0	126.0
Endrin 0.02%	1.6	6.9	4,406.0	120.0
Endrin 0.04%	1.2	5.8	5,009.0	137.0
Ekatox 0.02%	1.5	6.7	4,336.0	118.6
Ekatox 0.04%	1.2	6.3	4,781.0	130.0
Sevin 0.10%	1.8	7.1	4,404.0	120.5
Sevin 0.20%	1.0	5.7	4,600.0	125.8
Check (untreated)	4.3	11.8	3.656.0	100.0
L. S. D. at 5% level		3.2	621.8	
1% level		4.3	834.4	
Experiment in 1961 (Applications on Sept. 21, Oct. 2 & 12)				
M-Folidol 0.02%	3.1	10.1	3,421.0	120.6
M-Folidol 0.04%	3.1	10.0	3,439.0	121.3
Sumithion 0.02%	5.0	12.6	3,422.0	120.7
Sumithion 0.04%	2.9	9.8	3,680.0	129.8
EPN 0.02%	2.8	9.5	3,326.0	117.3
EPN 0.04%	1.6	6.9	3,749.0	132.2
Sevin 0.02%	7.2	15.6	3,295.0	116.2
Sevin 0.04%	5.3	13.2	3,367.0	118.7

Check (untreated)	8.6	16.9	2,836.0	100.0
L. S. D. at 5% level		2.4	408.8	
1% level		3.3	548.0	

from various treatments gave significantly higher than from untreated plot. Excellent control of this pest was obtained with high concentrations used in each treatment. The plots receiving higher concentrate of EPN spray gave highest yields in the experimentr. All treatments with the exception of lower concentrate of sevin spray in yield of rice were not signifincantly different between the different insecticides and various concentrations. 0.02% and 0.04% sevin sprays did not give a satisfactory contol of this pest as other treatments with same dosage in the experiments, as shown in table 1:

Discussion

The seond rice crop is usually infested by the borer both of the fourth and the fifth generation throughout the whole season, because the adults of fourth generation occurred were not abundant enough to damage severely the tillering stage early in the season in past four years. Therefore, the application of insecticides except in the mid season and late-season in 1960 experiments were made for controlling the borer on the boot stage, two or three times. All treatments gave the satisfactory results against this pest, On the other hand, rice borer control on the boot stage was more important than in the tillering stage during which the populations of adults of fourth generation emerged were lowest ant did not build up to the infestation of the tillering stage of the crops which were normally grown in the paddy fields. The yield of rice receiving insecticidal treatments ranged from 3,295.0 to 5,009.0 kg per hectare or an increase of 5.7% to 37.0% per unit area in all the experiments.

Summary

In the experiments, the treatments consisted of 19.5% endrin, 46.6% folidol, 40% M-folidol, 20% gusathion, 50% ekatox, 20% ekatox, 50% sumithion, 46% EPN and 50% sevin wettable powder. Two concentrations of each insecticide used were based on spraying the active ingredient at 0.48 to 0.96 kg, and 0.72 to 1.44 kg except 2.4 to 4.8 kg of sevin sprays per hectare. Eight treatments and four untreated plots were replicated four times in randomized blocks of each experiment as described above. The percentage of infested panicle in all the treatments showed significantly lower than in the checks. There was no significant differences between the insecticides and the concentrations used. All the treatments except lower dosages of various folidol sprays and other low dosage of each insecticide in 1958 experiments and low dosage of folidol sprays in 1959 experiments gave significantly higher yields than in the checks Good control of rice borer was obtained with higher dosages of

each insecticide and those dosages were nearly equal in effectiveness against this pest in all the experiments.

References Cited

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中文摘要

民國47年至50年台灣田間藥劑防治二期作三化螟試驗報告

陶家驊　湯慶銓　余健敏

嘉義農業試驗分所

本試驗在嘉義本分所山子頂農場及臺斗坑分場舉行，參加殺蟲劑9種即19.5%endrin，46.7% folidol，40%M-folidol，20 % ekatox，50% ekatox，20% gusathion，46% EPN，50% sumithion EC 及 50 % sevin WP.等，至於本試驗進行期中，視歷年螟蟲發生情形及爲害程度而定，先後分別舉行施用藥劑2次或3次，其中民國49年試驗區在中後兩期各施用藥劑1次外，餘均在後期舉行，並間隔8天或10天噴射1次或2次，每公頃施用藥劑有效成份，於民國47年—49年試驗區除 sevin 處理2.4至4.8公斤外，其餘均爲0.48至0.96公斤，民國50年試驗區諸處理均爲0.72至1.44公斤。茲據本試驗結果就以產量而言，俱獲顯著成果，對於稻穀單位面積增產量達5.7%至32.2%左右，其中以高濃度者爲優，唯施用0.02%—0.04% sevin 處理產量，雖較對照區差異顯著，但遜於其他藥劑之施用相同濃度，施用0.10%至0.20%sevin 防治螟蟲効果與其他藥劑施用0.02%至0.04%濃度者相等。茲據本試驗歷年結果，蓋以證明在後期應用藥劑防治螟蟲，頗爲重要，如果忽視，往往導致後期螟害損失甚鉅。總之，在後期舉行藥劑防治螟蟲，事前必須洞察螟害發生情形，然後以預防爲上策，如果一旦發現其爲害時，乃應用藥劑防治，爲時已晚矣。尙望治螟當局有識人士應加警惕，以免重蹈覆轍，爲國爲民增產，實利賴之。